

REMARKS:

Claims 1-12 and 15-19 are in the case and presented for consideration.

Claims 1, 2, 4 and 12 have been amended to further clarify the scope of the claimed invention. Specifically, these claims have been amended to clarify that the electrolyte film is a solid electrolyte film. Support for these amendments may be found at least at paragraphs [0040] (where, *inter alia*, it is specified that the “electrolyte and a separator must be plate materials having a certain degree of thickness in order to assure the strength of the single cell”), [0043](where, *inter alia*, it is specified that “as the electrolyte film 3 provided between the fuel electrode and the air electrode, use of a YSZ film which is dense...is preferable”); [0049] (where it is stated, *inter alia*, that “the electrolyte film 3 [has] a film thickness of approximately several ten μ ”).

No new matter has been added by this amendment.

Request for Bonafide Reconsideration

This application has been pending since it was filed on March 18, 2004 and has been actively prosecuted since the FAOM of February 16, 2006. Since then there have been six more actions with six responses and multiple IDS's and the Examiner's own searches so that it is believed the prior art has been fully explored and considered.

In the sincere interest of advancing this application to allowance, for a just disposal of the application that benefits both the Applicants with patent rights it is believed to deserve, and the public based on a compete examination of the application and the relevant prior art by the USPTO, the Examiner is respectfully urged to fully consider the claims now present and the arguments to follow.

If, after such bonafide reconsideration, the Examiner still feels that the test for nonobviousness set forth in 35 U.S.C. 103 has really not been met, the Examiner is

respectfully requested and urges to telephone the undersigned with any suggests that the Examiner feels might advance this application to allowance, in a effort to avoid the continued rounds of Rejection/Amendment/Rejection this application has experience for the past years.

Rejections Under 35 U.S.C. §103

The Office has rejected Claims 1-8,11-12,17, and 19 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,476,196 to Poeppel et al. (Poeppel et al.) in view of U.S. Patent No. 5,139,896 to Smith ("Smith").

The Office asserts that Poeppel et al. discloses a solid oxide side fuel cell having monolithic cross flow core and manifold comprising an insulated core with thin layers of an electrolyte and intermediate film (or separator) material sandwiched between layers of porous anode and cathode electrodes respectively (the separator material in the current application being considered disclosed as a strontium doped lanthanum chromite based oxide such as lanthanum chromite (the intermediate film material in the reference being lanthanum chromite; a core that has passageways for gas flow paths that are laid out in a crosswise or orthogonal pattern and has transverse manifolds for delivery and removal of reactant material); with conductive web walls or conductive spacers between the individual cells and in the parallel and perpendicular direction respectively depending if it is an anode of cathode web wall; an electrolyte and separator material formed via the tape cast method (wetted process) for adhering to the anode and cathode electrode; a ceramic paste being used to pack annular space to seal the structure and prevent gas leakage; conductors or conductive jointing material that link the individual fuel cells; a thin layer of electrolyte material can be folded down or up on the side or end portions of the anode and cathode; the folded material enclosing the side or end portions to separate the fuel and

oxidant gases on opposite sides of the porous electrode material; the passageways for the fuel being formed with only anode electrode material; the passageways for the oxidant being formed with only the cathode electrode material.

The Office further asserts that Poeppel et al. discloses that the fuel flow and the oxidant flow are transverse or orthogonal with respect to each other. The Office notes that the reference teaches the use of anode, cathode, electrolyte, and separator materials that are matched as closely as possible to one another with respect to each coefficient of thermal expansion.

Additionally, the Office holds the view that Poeppel et al. discloses the same or an obvious variant of the applicant's electrolyte and separator films.

The limitation "scrapped off," has been interpreted by the Office as a product- by- process limitation. It is noted in the Official Action that the electrolyte of Poeppel et al. does not exist on the side surfaces of the cathode. The Office is interpreting this as meeting the limitation "scrapped off."

The Office is also interpreting Poeppel et al. as teaching an entire cross section of the electrodes forming a gas flow path based on the fact that the electrode materials are porous.

Regarding claims 1 and 12, the Office concedes that, while Poeppel et al. discloses a cathode with pores, it does not disclose an electrode absent of through-passages, the porous substrate having a sufficient gas flow property. It is asserted that Smith supplies the missing teaching in that it teaches a cathode and an anode substrate in which the porosity of the cathode and anode permits the passage of oxidant gas and fuel gas, respectively. It is explained that Smith teaches that configurations are possible in a fuel cell stack, such as channels, or convolutions.

The Office therefore holds that it would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the shape of the cathode of Poeppel et al. to be free of through-passages as taught by Smith, since Smith teaches that electrodes can be made with or without through-passages.

Applicant respectfully traverses the view that the present invention is rendered obvious by combining the electrode of Smith patent with the teaching of Poeppel et al.

First, one of ordinary skill in the art would not be motivated to combine Smith with Poeppel et al. to arrive at the presently-claimed invention. The teaching of Smith does not relate to a solid electrolyte fuel cell (SOFC), as do the present invention and Poeppel et al. Rather, Smith relates to a molten carbonate type fuel cell (MCFC).

A person skilled in the art would understand that a reaction mechanism will be completely different if the type of fuel cell differs. Particularly, since the electrolyte of MCFC is a liquid (molten salt), the electrolyte of a liquid contacts an electrode and gas (a fuel gas or air) in Smith. In contrast, since the electrolyte of a SOFC is a solid, the electrolyte of a solid contacts an electrode and gas (a fuel gas or air) in Poeppel et al. When a liquid contacts an electrode and gas, and when a solid contacts an electrode and gas, it is obvious for a person skilled in the art that the conformation of the electrode reactions differ.

Moreover, for a MCFC, it is generally known to use the electrode material of very high electronic conductivity. Therefore, even if it makes porosity of an electrode high, electrode performance does not fall so that advance of an electrochemical reaction in electrodes is prevented.

On the other hand, in a SOFC such as is taught in Poeppel et al., the electrode member is made porous in order to improve the state of the electrochemical reaction which advances in the electrode. The gas flow property of the electrode member is secured in Poeppel et al. by the passageways.

If the constitution of this conventional SOFC is taken into consideration, the porosity of the electrode of Smith patent (MCFC) clearly cannot be applied to the electrode of a SOFC, such as Poeppel et al.

Moreover, the working temperature of a SOFC is usually about 1000 °C, whereas the working temperature of MCFC is usually about 650 °C.

Thus, it is utterly impossible to combine the electrode disclosed in Smith with the teaching of Poeppel et al. to arrive at a functional fuel cell apparatus, not to mention the presently-claimed fuel cell apparatus. One of ordinary skill in the art to which the present invention pertains, even assuming such an artisan would encounter Smith, would not be motivated to combine its teaching with that of Poeppel et al.

Against this backdrop, the presently-claimed invention provides a sufficient gas flow property for the electrode member itself, which constitutes the single cell of SOFC and omits the passageways necessary for the function of the fuel cell according to Poeppel et al.

Therefore, the strength of a single cell having improved strength is an unexpected result of the novel and unobvious simplified structure of the presently-claimed invention.

The single cell can then be more easily enlarged for various applications. For example, it becomes possible, by enlarging a single cell, to increase in the power generation performance. See published application at paragraph [0012].

Furthermore, since the passageways of Poeppel et al. have been rendered

dispensable, the manufacture of the single cell becomes comparatively easy.

In view the foregoing, it is respectfully submitted that Smith could in no way be combined with Poeppel et al. to arrive at the presently-claimed invention or to render it obvious.

Conclusion

Accordingly, Applicant believes that all the claims are now in condition for allowance and favorable action is respectfully requested. Should there be any issues that have not been addressed to the Examiner's satisfaction, Applicant invites the Examiner to contact the undersigned attorney.

If any fees other than those submitted herewith are due in connection with this response, please charge such fees to Deposit Account No. 14-1431.

Respectfully submitted,

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